

DYNAMICS OF MAGNETIC CLOUDS IN INTERPLANETARY SPACE

Tyan Yeh

Cooperative Institute for Research in Environmental Sciences,
University of Colorado, Boulder, Colorado, U.S.A. 8030998795
18.

CU 508845

ABSTRACT

Magnetic clouds observed in interplanetary space may be regarded as extraneous bodies immersed in the magnetized medium of the solar wind. The interface between a magnetic cloud and its surrounding medium separates the internal and external magnetic fields. Polarization currents are induced in the peripheral layer to make the ambient magnetic field tangential.

The motion of a magnetic cloud through the interplanetary medium may be partitioned into a translational motion of the magnetic cloud as a whole and an expansive motion of the volume relative to the axis of the magnetic cloud. The translational motion is determined by two kinds of forces. One of them is the gravitational force exerted by the Sun. The other is the hydromagnetic buoyancy force exerted by the surrounding medium. On the other hand, the expansive motion is determined by the pressure gradient that sustains the gross difference between the internal and external pressures and by the self-induced magnetic force that results from the interaction among the internal currents. The force resulting from the interaction between internal and external currents is a part of the hydromagnetic buoyancy force, which is manifested by a thermal stress caused by the inhomogeneity of the ambient magnetic pressure.